No. 12.—*Bird Remains from Cave Deposits on Great Exuma Island in the Bahamas*

By Alexander Wetmore

During recent months the Museum of Comparative Zoölogy has received a collection of animal bones from cavern deposits on Great Exuma Island in the Bahama group that contains bird remains of exceptional interest. The specimens in question were sorted out by Mrs. Vivienne Knowles from cave earth excavated for use as fertilizer, and were obtained during the early part of 1937. It is fortunate indeed that Mrs. Knowles has had the foresight to preserve this material since the information secured from the bird bones represents the most important contribution in new information concerning the avifauna of the Bahamas that has come in many years.

In brief, in this small collection there are included three extinct forms, viz., two hawks and a giant owl, that are new to science. There are in addition remains of a crow and of a flicker, both like species living today in Cuba. It is easily evident that the bird life of the Bahaman group in past centuries has contained far more species than in modern times, the present avifauna being a mere remnant of what was found in the past. Explanation of the reduction in kinds of birds in these islands is naturally speculative, but we may suppose with reason that the hurricanes that periodically sweep this area have been one definite factor, possibly the one of greatest importance. It will be recalled that only recently a tremendous storm that crossed the southern tip of Florida and the Florida Keys destroyed the majority of the individuals of the great white heron (*Ardea occidentalis*) now restricted in range to that section. A slightly greater spread of the area of maximum damage, or a longer continuation of the period of greatest violence, might have wiped out the few herons that remained. It is easy to believe that tremendous storms of a similar nature centering on islands in the Bahamas in past years may have completely overwhelmed some of them so as to destroy many elements in the indigenous fauna.

As for the age of these cavern deposits there is much uncertainty. The present collection is without question of the pre-Columbian period.

In previous years I have supposed that similar bird remains from caves in Puerto Rico and Haiti dated back from five hundred to two thousand years. As my studies of this type of material continue I have become more and more convinced that it has a considerable antiquity, and that most of it probably should be given the maximum span of years indicated, with the possibility that it has even greater age.

Preliminary examination of the collection was made by Dr. Glover M. Allen, and subsequently the bones were placed in my hands for study by Dr. Thomas Barbour, Director of the Museum of Comparative Zoölogy. To both of these gentlemen I am indebted for this opportunity. Drawings illustrating the various species have been made by Sydney Prentice.

Family ACCIPITRIDAE

Accipiter striatus velox (Wilson). Sharp-shinned Hawk

Falco velox Wilson, Amer. Orn., 5, 1812, p. 116, pl. 45, fig. 1. (Banks of the Schuylkill River near Philadelphia, Pennsylvania.)

A right humerus (Cat. no. 2255) lacking the head belongs to the sharp-shinned hawk, being the form that nests in northern North America that has been obtained as a migrant on New Providence Island in the Bahamas. The specimen has the dimensions of a female, being decidedly larger than the resident sharp-shinned hawks of the Greater Antilles.

While the sharp-shinned hawk is listed in the fourth edition of the A. O. U. Check-list published in 1931 as *Accipiter velox velox*, since this form is conspecific with the West Indian races, it must bear the specific name *striatus* of Vieillot, this having been published before *velox* of Wilson.

Calohierax gen. nov.

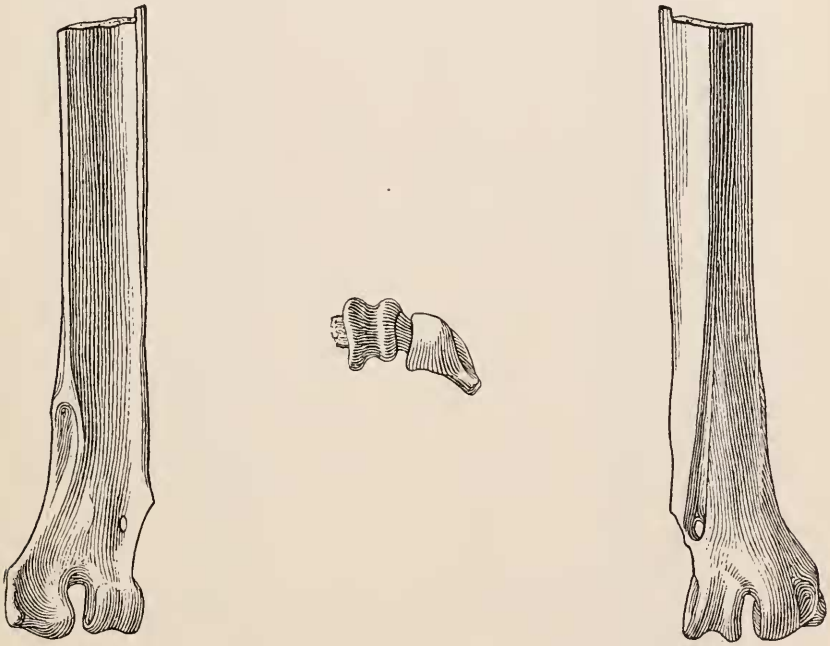
Characters. Distal end of metatarsus similar to that of Buteo[1] but with trochlea reduced in size; second trochlea with projecting wing shortened.

Type, *Calohierax quadratus*, sp. nov.

[1] *Buteo* Lacépède, Tabl. Ois., 1799, p. 4.

Calohierax quadratus sp. nov.

Characters. Distal end of metatarsus (figs. 1–3) similar to that of *Buteo jamaicensis* (Gmelin)[1] but with the projecting outer portion of the second trochlea much reduced so that the trochlea appears square and block-like; middle trochlea smaller.



Figs. 1–3. Metatarsus, type, of *Calohierax quadratus*, including the distal profile of the trochlea. (About twice natural size.)

Description. Type, distal part of right tarso-metatarsus with outer trochlea missing, Museum of Comparative Zoölogy Cat. no. 2256, collected from cave deposits on Great Exuma Island, Bahama Islands, in 1937, by Mrs. Vivienne Knowles.

Lower portion of shaft triangular in outline, with a broad U-shaped depression on its posterior face; outer surface nearly plane, narrowing

[1] *Falco jamaicensis* Gmelin, Syst. Nat., **1**, pt. 1, 1788, p. 266.

gradually toward the trochlea; inner surface slightly concave, broadened below, where it merges gradually into an expanded section that supports the trochlea; a well-marked inferior foramen located at the bottom of a long groove extending down the front of the shaft; outer trochlea missing; middle trochlea relatively small, elliptical in outline, much excavated on its lateral faces, with a deep groove extending clear around its articular surface, separated by a narrow intertrochlear sulcus from the inner trochlea; inner trochlea seen from behind roughly quadrangular, this posterior surface being faintly concave; outer face deeply concave; the projecting outer margin, prominent in related hawks, much shortened and reduced; impression for the articulation of the hallux prominent, located rather low on the shaft. Bone without organic matter, ivory white in color.

Measurements. Smallest transverse diameter of shaft 5.8; transverse diameter of middle trochlea 3.5; of outer trochlea 4.7 mm.

Remarks. The present species, to judge from the distal part of the metatarsus, was slightly smaller than the modern red-tailed hawk, having more or less the dimensions of the red-shouldered hawk (*Buteo lineatus*). While regarded as a member of the subfamily *Buteoninae* it differs from any species of that group known to me in the narrowed form of the outer trochlea; in fact in this it is unlike any of its relatives, this being the principal reason for its description, as ordinarily a specimen of such fragmentary nature would hardly warrant specific identification.

Calohierax quadratus represents a highly peculiar form of a type new to the Bahama Islands, and one apparently not closely related to any of the living hawks of tropical America.

Titanohierax new genus

Characters. Similar to living *Hypomorphnus urubitinga*[1] but much larger; tarso-metatarsus (Figs. 4–7) relatively broader at distal end; middle trochlea relatively longer and larger, projecting farther distally in relation to outer trochlea; facet for articulation of hallux extending relatively higher on shaft; shaft more robust.

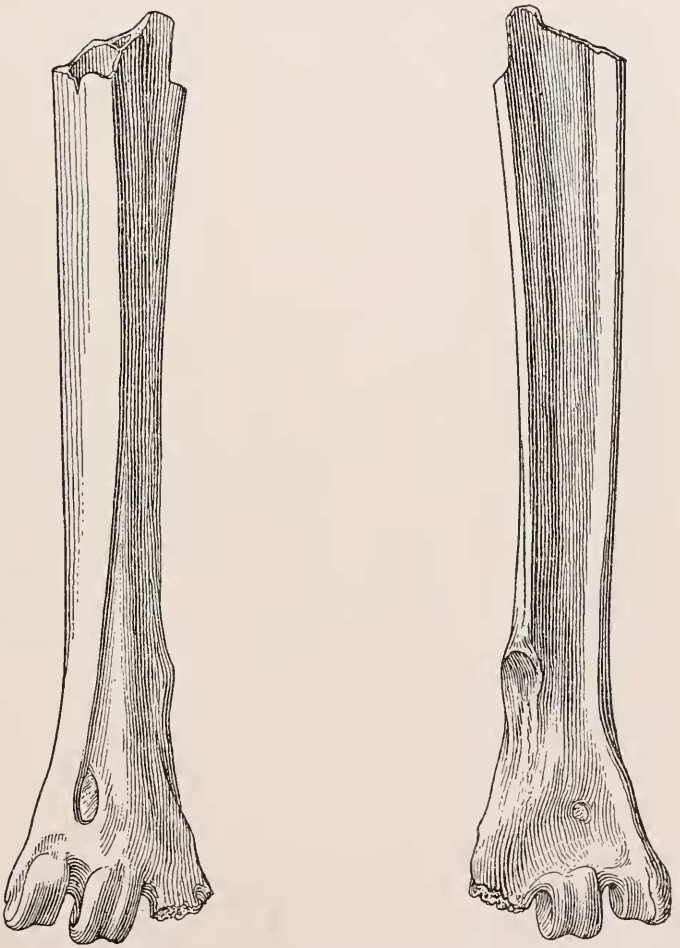
Type, *Titanohierax gloveralleni*, sp. nov.

[1] *Falco Urubitinga* Gmelin, Syst. Nat., **1**, pt. 1, 1788, p. 265.

TITANOHIERAX GLOVERALLENI sp. nov.

Characters. Those of genus as given above.

Description. Type, Museum of Comparative Zoölogy Cat. No.

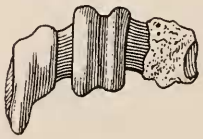


Figs. 4–5. Two views of metatarsus, type, of *Titanohierax gloveralleni*, natural size.

2257, right tarso-metatarsus with upper part of shaft and greater part of inner trochlea missing, from cave deposits on Great Exuma

Island, Bahama Islands, collected by Mrs. Vivienne Knowles, in 1937.

Outer trochlea narrow, compressed laterally, its outer margin pro-



Figs. 6–7. Two views of metatarsus, type, of *Titanohierax gloveralleni*, natural size.

duced in a thin, posteriorly projecting plate that is about one third the width of the trochlea, making an open angle with the body of the

trochlea; inner face of trochlea somewhat excavated, groove separating it from the middle trochlea relatively shallow and narrow; middle trochlea heavier, a flattened ellipse in outline, its axis forming a slight angle with the axis of the shaft, with its sides excavated, and a pronounced groove extending around the articular surface; wider at base anteriorly than on posterior side; inner trochlea missing except for broad, flattened base; lower end of shaft much flattened and expanded, with the outer and middle trochlea raised above it by a distinct line; inferior foramen small and circular on posterior face, larger and elongate oval on anterior surface, with a faintly indicated, rather broad groove leading into it from above; body of shaft strong and much elongated, outer face plane, viewed from the side, narrow at the lower end, where it extends smoothly onto the outer trochlea, and expanding gradually above to continue upward as a broad, flattened surface; inner face more irregular, but flattened in general, becoming somewhat excavated in its upper section so that it is distinctly concave; meeting the outer face at a sharp angle to form a distinct ridge; posterior face, above the articulation of the hallux, a broad, open groove, deepening above, and marked by sharply projecting edges; facet for articulation of the hallux deeply impressed, located rather high on shaft. Bone without organic matter, ivory white in color.

Measurements. Smallest transverse breadth of shaft 13.0; transverse breadth at base of trochlea 22.5 mm.

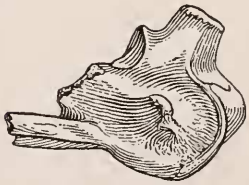
Remarks. In general appearance the metatarsus is so closely similar to that of *Hypomorphnus* as to leave no question as to its near relation to that genus. In its size it is most extraordinary, being truly a giant among hawks. While it is so broken that few definite measurements may be given, its dimensions are easily evident on examining the accompanying illustrations, particularly the plate on which it is photographed beside a metatarsus of a female *Hypomorphnus urubitinga azarae* from Argentina (Plate 1).

From *Wetmoregyps daggetti* (L. H. Miller)[1] from the Pleistocene of California *Titanohierax* differs in the same manner that it does from *Hypomorphnus*. While in total length of metatarsus *Wetmoregyps* may have been near *Titanohierax* the latter has the bone much heavier and

[1]*Morphnus daggetti* L. H. Miller, Condor, **17**, 1915, p. 179, fig. 63 (Pleistocene of Rancho La Brea). For an excellent illustration of the tarso-metatarsus see Howard, H., Carnegie Inst. Washington, Publ. No. 429, 1932, pl. 13.

more robust. The greater elevation of the facet for the hallux in the Bahaman species is especially noticeable.

From the size of the metatarsus *Titanohierax* is supposed to have been nearly twice as large as the existing black hawk of South America with which it is compared.



Figs. 8–9. Proximal end of metacarpal of *Titanohierax gloveralleni*, natural size.

There is also in the collection the head of a right metacarpal bone (Cat. no. 2258) that obviously belongs to this same species. This fragment (figs. 8–9) is generally similar to that of *Hypomorphnus* except for its dimensions, being nearly twice as large as in the living bird.

The size element in this species is found thus in both anterior and posterior limbs, making this the largest known hawk of its group. That it should be found in the Bahama Islands seems most strange. On Exuma it lived with the rodent *Geocapromys* whose bones are found in abundance in the same cave.

Family SCOLOPACIDAE

Capella delicata (Ord). Wilson's Snipe

Scolopax delicata Ord, in reprint Wilson, Amer. Orn., **9**, 1825, p. ccxviii (Pennsylvania).

This migrant from North America is represented by a left humerus and right and left coracoids (Cat. No. 2260) that come from an individual of large size.

The specimens are assigned to this species with some mental reservation as both humerus and coracoids are considerably larger than those of any skeleton of the Wilson's snipe available. The humerus measures 42.1 mm. in total length, and the coracoids 21.8 and 22.4 mm. in the same dimension. In four Wilson's snipe the longest humerus is only 40.4 mm. long, while the smallest is 37.0 mm., this being the size range to be expected in such a species.

The bones from Great Exuma Island do not come from *Capella anthonyi* (Wetmore) described from caves on Puerto Rico, as I have ascertained by comparison with the type material. It is possible that they represent an extinct species, a matter that is left for future consideration when more skeletons of the Wilson's snipe are available for study.

The Wilson's snipe is found throughout the West Indies in its southern flights, and has been recorded from many of the Bahama Islands.

Family COLUMBIDAE

Columba squamosa Bonnaterre. Scaled Pigeon

Columba squamosa Bonnaterre, Tabl. Enc. Méth., **1**, 1792, p. 234. (Guadeloupe Island, West Indies.)

Represented by somewhat fragmentary material, including 5 ulnae, a metacarpal, a coracoid and a femur (Cat. no. 2259), which constitute the first record of this pigeon from the Bahama Islands. As the bird ranges widely through both Greater and Lesser Antilles and has occurred casually at Key West, Fla., its occurrence in the Bahamas in earlier times need occasion no surprise.

In the skeletal elements listed above this species is larger than the white-crowned pigeon, *Columba leucocephala* which is now common in the Bahaman Islands.

OREOPELEIA CHRYSIA (Bonaparte). Key West Quail-dove

Geotrygon chrysia Bonaparte, Compt. Rend., **40**, 1855, p. 100. (Florida.)

The Key West quail-dove is represented by a humerus and a metatarsus (Cat. no. 2261). The species is one that has been recorded on many islands in the Bahamas.

Family TYTONIDAE

TYTO POLLENS sp. nov.

Characters. Femur (figs. 10–14) similar to that of *Tyto ostologa*

Figs. 10–11. Two views of femur, type, of *Tyto pollens*, natural size.

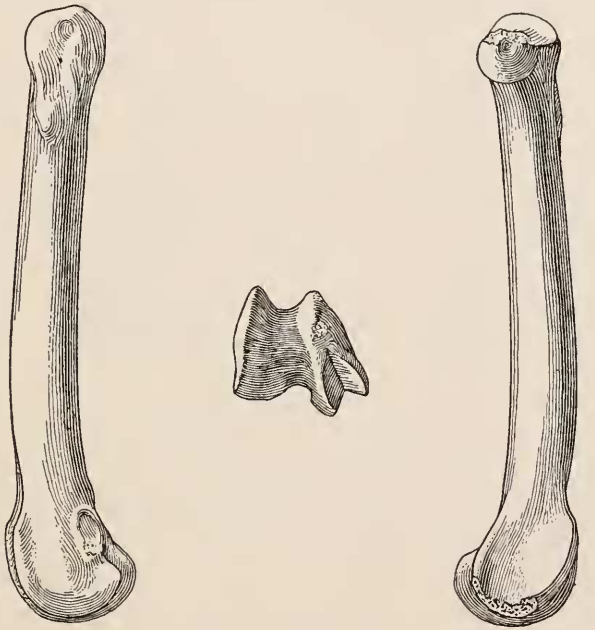
Wetmore[1] but slightly larger; trochanteric ridge larger and more robust.

Description. Type, Museum Comparative Zoölogy Cat. No. 2262,

[1] *Tyto ostologa* Wetmore, Smiths. Misc. Coll., **74**, no. 4, October 17, 1922, p. 2. (From cave deposits at St. Michel de l'Atalye, Republic of Haiti.)

left femur, from cave deposits on Great Exuma Island, Bahama Islands, collected by Mrs. Vivienne Knowles, in 1937.

Head rather small, with a deep depression for the attachment of the ligamentum teres; neck slightly produced; iliac facet rather flattened and elongated; trochanter strong, with a heavily developed trochan-



Figs. 12–14. Three views of femur, type, of *Tyto pollens*, including a profile of the distal end, natural size.

teric ridge that is strongly produced at its lower end; obturator ridge fairly well developed; shaft strong, slightly flattened to an elliptical form from above downward, and straight for three fourths of its length from the proximal end, slightly more flattened distally; anterior muscular line well marked, extending in a nearly straight line diagonally the length of the upper surface of the shaft from below the trochanter to near the base of the external margin of the rotular groove; posterior intermuscular line also well marked, its course roughly parallel to

that of the similar line on the upper surface of the bone; fibular groove sharply angular, fairly deep; external condyle strong, projecting well beyond the level of the internal condyle; internal condyle heavy and broad; rotular groove deeply impressed and wide; intercondylar fossa narrow and openly U-shaped; popliteal area broad and nearly plane, with a sharply angular overhang beneath the intercondylar fossa. Bone brownish white in color, entirely devoid of fatty or similar organic matter.

Measurements. Total length 82.0; transverse breath through head 16.8; transverse breadth through condyles 18.1 mm.; transverse breadth of shaft at center 8.2 mm.

Remarks. This great owl completes the picture of predators on the large *Geocapromys*, since it may be supposed with logic that it harried these mammals at dusk and by night while *Titanohierax* was their nemesis by day. It is probable also that the owl, representative of a group that lives regularly in caverns, was responsible in great part for the deposit of rodent bones through regurgitated pellets accumulated beneath its nests and roosts.

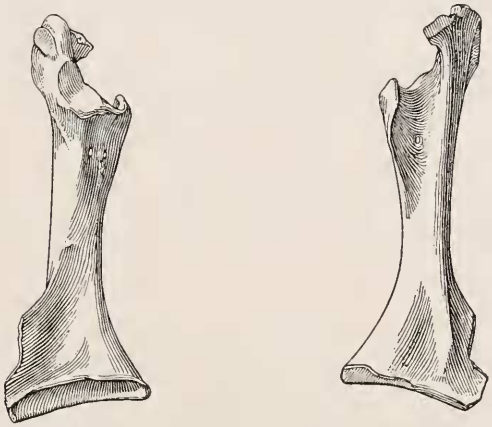
Interest in *Tyto ostologa* of Hispaniola, giant among its kind, is enhanced by the find of the even more robust *Tyto pollens* in the Bahamas, as these two indicate a wide distribution for a peculiar group whose span of existence seemingly was coincident with that of an abundant rodent fauna, and whose disappearance apparently came with the extinction of this prey.

In addition to the femur selected as type there are four other fragments of bone (Cat. no. 2263) in the collection that come from the skeleton of *Tyto pollens*. The head of a right tibio-tarsus agrees with the corresponding bone in *Tyto ostologa* but is slightly larger. Its transverse diameter is 17.5 mm.

The shaft of a left metacarpal II is also more robust in comparison with that of the Haitian species, as is the proximal end of a left ulna. Both bones are too fragmentary to afford satisfactory measurements. A left coracoid, nearly complete (figs. 15–16) is slightly larger, and has the sternal facet proportionally larger, indicating a bird of definitely larger size, though here again small missing portions on proximal and distal ends prevent accurate measurements.

Comparison of all these has been made with a considerable series of

bones of *Tyto ostologa* from Haitian caves in a collection that I have under study, but on which report has not yet been made. The conclusion that the bird of the Bahamas was somewhat larger and stronger



Figs. 15–16. Coracoid of *Tyto pollens*, natural size.

than that of Haiti comes from a consideration of size variation in the Haitian material mentioned, as well as from study of individual variation in the skeleton of the living *Tyto alba perlata*, the barn owl of the United States.

Family STRIGIDAE

Speotyto cunicularia (Molina). Burrowing Owl

Strix cunicularia Molina, Sagg. Stor. Nat. Chili, 1782, p. 263.

A broken metatarsus (Cat. no. 2264) comes from this species, resident on many islands in the Bahamas.

Family PICIDAE

Colaptes chrysocaulosus Gundlach. Cuban Flicker

Colaptes chrysocaulosus Gundlach, Ann. Lyc. Nat. Hist. New York, **6**, 1858, p. 273. (Cuba.)

A left humerus and a left tibio-tarsus (Cat. No. 2265) of a flicker agree so minutely with bones of the Cuban bird that they are not to be separated specifically, though it is probable that the Bahaman bird in life may have had color characters that set it apart as a distinct geographic race, as is true of the same bird on Grand Cayman Island today.

These remains present a new record for the Bahama Islands, and a considerable extension of range for the species.

Centurus superciliaris (Temminck). West Indian Red-bellied Woodpecker

Picus superciliaris Temminck, Planch. Col., livr. 73[e], **4**, 1827, pl. 433 and text. (Cuba.)

A right metatarsus (Cat. no. 2266) comes from this woodpecker, widely distributed as a species in the Bahaman Islands. It is not practicable with present skeletal material to determine the subspecies to which this specimen belongs, but it may be noted that it is the first record for Great Exuma Island. It may represent an unknown geographic race, the three forms recognized at present from the Bahama Islands being restricted to Great Bahama, Abaco and Watling Islands respectively.

The specimen has a length of 23.5 mm.

Family CORVIDAE

Corvus nasicus Temminck. Cuban Crow

Corvus nasicus Temminck, Planch. Col., livr. 70, **2**, 1826, pl. 413. (Cuba.)

Among the other birds from Great Exuma Island there are several bones from crows, including a complete humerus from an immature individual with the bone still porous, parts of two other humeri, and an ulna with the olecranon missing (Cat. nos. 2267–2268). These come from a species smaller than *Corvus leucognaphalus* and larger than *C. palmarum*. The identification of this species has been somewhat difficult, and though at first I considered it an extinct form unknown to science, I have finally concluded that it is *Corvus nasicus*, the Cuban

crow, which in addition to its Cuban range is recorded from Great Caicos Island in the southern Bahamas.

No skeletal material of *C. nasicus* is at this time available to me but from examination of skins it appears that the wing in this species is intermediate in length between that of *leucognaphalus* and *palmarum* so that in wing length *nasicus* has the same relative size position as do the bones from Great Exuma Island. It is possible in some of the skins of *nasicus* at hand to determine the approximate length of the ulna which agrees with that of the ulna from Great Exuma, being definitely shorter than that of *leucognaphalus*. On this basis these bones are identified as *C. nasicus*, which seemingly formerly had an extended range through the Bahama Islands.

Family MIMIDAE

Margarops fuscatus (Vieillot). Pearly-eyed Thrasher

Turdus fuscatus Vieillot, Ois. Amer. Sept., **2**, 1807, p. 1, pl. 57 bis. (Santo Domingo; Puerto Rico.)

Two humeri (Cat. no. 2269) of this common bird were obtained.

Family TURDIDAE

Mimocichla plumbea (Linnaeus). Bahama Thrush

Turdus plumbeus Linnaeus, Syst. Nat., ed. 10, **1**, 1758, p. 169. (America.)

Represented by a left humerus (Cat. no. 2270).